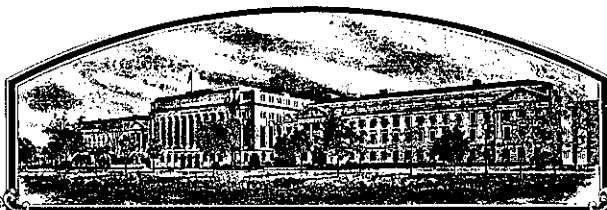


No.

8400027



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Kansas Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen** YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT

'2157'

AMENDED CERTIFICATE

*Original grant January 31, 1986.

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D. C. this 29th day of March in the year of our Lord one thousand nine hundred and ninety-one.

Attest:

Rexsith Evans
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Ed Madigan
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, MEAT, GRAIN & SEED DIVISION

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

FORM APPROVED: OMB NO.0581-0055

No certificate for plant variety protection may be issued unless a completed application form has been received (5 U.S.C. 553).

1. NAME OF APPLICANT(S) KANSAS AGRICULTURAL Pioneer Hi-Bred International, Inc. Plant Breeding Division EXPERIMENT STATION Dept. of Cereal Seed Breeding	2. TEMPORARY DESIGNATION W7442B	3. VARIETY NAME 2157
4. ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) WATERS HALL Rt. 2 KANSAS STATE UNIVERSITY MANHATTAN, KS 66506-4008 Hutchinson, Kansas 67501	5. PHONE (Include area code) (913) 532-6147 (316) 662-5439	FOR OFFICIAL USE ONLY VPPO NUMBER 8400027

6. GENUS AND SPECIES NAME Triticum aestivum	7. FAMILY NAME (Botanical) gramineae	FILING DATE 12/23/83 TIME 2:30 <input type="checkbox"/> A.M. <input checked="" type="checkbox"/> P.M.
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8. KIND NAME Wheat	9. DATE OF DETERMINATION September 1, 1981	AMOUNT FOR FILING \$ 1,000 DATE 12/23/83
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10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Corporation	AMOUNT FOR CERTIFICATE \$ 500.00 DATE 12/27/85
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11. IF INCORPORATED, GIVE STATE OF INCORPORATION Iowa	12. DATE OF INCORPORATION May, 1926
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13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS Dr. Charles Hayward Pioneer Hi-Bred International, Inc. Rt. 2 Hutchinson, Kansas 67501 VERNON A. SCHAEFFER DEPARTMENT OF AGRONOMY THROCKMORTON HALL KANSAS STATE UNIVERSITY MANHATTAN, KS 66506-5501 (913) 532-6115

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED

a. <input checked="" type="checkbox"/> Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)	c. <input checked="" type="checkbox"/> Exhibit C, Objective Description of the Variety (Request form from Plant Variety Protection Office.)
b. <input checked="" type="checkbox"/> Exhibit B, Novelty Statement	d. <input checked="" type="checkbox"/> Exhibit D, Additional Description of the Variety

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act.) ☒ Yes (If "Yes," answer items 16 and 17 below) ☒ No

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input checked="" type="checkbox"/> Foundation <input checked="" type="checkbox"/> Registered <input checked="" type="checkbox"/> Certified
--	--

18. DID THE APPLICANT(S) FILE FOR PROTECTION OF THE VARIETY IN THE U.S. OR OTHER COUNTRIES?
☐ Yes (If "Yes," give names of countries and dates)
☒ No

19. HAVE RIGHTS BEEN GRANTED IN THE U.S. OR OTHER COUNTRIES?
☐ Yes (If "Yes," give names of countries and dates)
☒ No

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.
The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT Pioneer Hi-Bred International, Inc. by Charles F. Hayward	DATE December 8, 1983
SIGNATURE OF APPLICANT	DATE

14A. Exhibit A, Origin and Breeding History of the Variety

2157, *Triticum aestivum* L. em Thell, a hard red winter wheat, was developed by Pioneer Hi-Bred International, Inc. from the cross of Caprock/4/Etoile de Choisy//Thorne/Clarkan/3/CI13390/5/SC3212. A semi-dwarf mutant was selected from the Etoile de Choisy//Thorne/Clarkan cross. This mutant was crossed to CI13390. A pure line selection from this cross was crossed to Caprock. This single cross was then crossed to SC3212. SC3212 is a pure line resulting from a Sturdy outcross.

The F₁ generation was grown in the greenhouse at Hutchinson in 1971. Single F₂ plants were selected in 1973 and the bulked seed of each plant was advanced in the field at Hutchinson in 1974. Heads were selected from the 1974 bulk and planted as individual rows in 1975. Seed from a single F₄-derived row was bulked and was advanced from the F₅ to the F₇ at Hutchinson. Single heads were selected from the F₇ bulk in 1978. The F₇-derived seed from one head was grown in a row in 1979 and the bulked progeny plot from this row was selected in 1980 near Hastings, Nebraska. 2157 has been in yield tests and milling and baking trials since 1981.

2157 has shown uniformity and stability for all traits as described in Exhibit C (Form LPGS-470-6) -- "Objective Description of Variety."

No variants have been observed in 2157.

14B. Exhibit B, Novelty Statement

2157 is an awned semidwarf hard red winter wheat cultivar, most similar to the variety Sturdy in many phenotypic and agronomic traits. 2157 is uniquely different from Sturdy in leaf carriage and in Hessian fly resistance. 2157 has an erect flag leaf at booting, whereas Sturdy has a recurved flag leaf. Also, Sturdy is susceptible to all races of Hessian fly while 2157 is resistant to races GP, A, B, and C.

2157 averaged about 99 cm in height at Hutchinson, Kansas, in 1983, about 2 cm taller than Sturdy but 21 cm shorter than Scout. In Pioneer trials, 2157 has been more winterhardy than Sturdy.

2157 and Sturdy show adult plant resistance to current races of leaf rust (*Puccinia recondita* Rob. ex Desm. f. sp. *tritici*) but little resistance to current races of stem rust (*P. graminis* Pers. f. sp. *tritici* Eriks) in Kansas.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (TRITICUM SPP.)

INSTRUCTIONS: See Reverse.

NAME OF APPLICANT(S)

FOR OFFICIAL USE ONLY

Pioneer Hi-Bred International, Inc.

PVPO NUMBER

8400027

ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code)

Plant Breeding Division
Department of Cereal Seed Breeding
Rt. 2
Hutchinson, Kansas 67501

VARIETY NAME OR TEMPORARY DESIGNATION

Place the appropriate number that describes the varietal character of this variety in the boxes below.

Place a zero in first box (e.g., 0 8 9 or 0 9) when number is either 99 or less or 9 or less.

1. KIND:

1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:

1 = SPRING 2 = WINTER 3 = OTHER (Specify) 1 = SOFT 2 = HARD 3 = OTHER (Specify)

1 = WHITE 2 = RED 3 = OTHER (Specify)

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:

2 3 0 FIRST FLOWERING 2 3 7 LAST FLOWERING

4. MATURITY (50% Flowering):

0 5 NO. OF DAYS EARLIER THAN 2 1 = ARTHUR 2 = SCOUT 3 = CHRIS
NO. OF DAYS LATER THAN 4 = LEMHI 5 = NUGAINES 6 = LEEDS

5. PLANT HEIGHT (From soil level to top of head):

0 9 9 CM. HIGH

CM. TALLER THAN

2 1 CM. SHORTER THAN

1 = ARTHUR 2 = SCOUT 3 = CHRIS
4 = LEMHI 5 = NUGAINES 6 = LEEDS

6. PLANT COLOR AT BOOTING (See reverse):

3 1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHUR COLOR:

1 1 = YELLOW 2 = PURPLE

8. STEM:

1 Anthocyanin: 1 = ABSENT 2 = PRESENT

2 Waxy bloom: 1 = ABSENT 2 = PRESENT

1 Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT

1 Internodes: 1 = HOLLOW 2 = SOLID

0 4 NO. OF NODES (Originating from node above ground)

2 7 CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:

1 Anthocyanin: 1 = ABSENT 2 = PRESENT

1 Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:

1 Flag leaf at booting stage: 1 = ERECT 2 = RECURVED 3 = OTHER (Specify)

1 Flag leaf: 1 = NOT TWISTED 2 = TWISTED

1 Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT

2 Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT

0 9 MM. LEAF WIDTH (First leaf below flag leaf)

2 2 CM. LEAF LENGTH (First leaf below flag leaf)

11. HEAD:

☐ 1 Density: 1 = LAX 2 = DENSE
 ☐ 4 Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE
 4 = OTHER (Specify) Fusiform

☐ 4 Awedness: 1 = AWWLESS 2 = APICALLY AWWLETED 3 = AWWLETED 4 = AWWED

☐ 1 Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED
 5 = BROWN 6 = BLACK 7 = OTHER (Specify):

☐ 0 ☐ 9 CM. LENGTH
 ☐ 0 ☐ 9 MM. WIDTH

12. GLUMES AT MATURITY:

☐ 1 Length: 1 = SHORT (CA. 7 mm.) 2 = MEDIUM (CA. 8 mm.)
 3 = LONG (CA. 9 mm.)
 ☐ 1 Width: 1 = NARROW (CA. 3 mm.) 2 = MEDIUM (CA. 3.5 mm.)
 3 = WIDE (CA. 4 mm.)

☐ 4 Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED
 4 = SQUARE 5 = ELEVATED 6 = APICULATE
 ☐ 3 Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

☐ 1 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

☐ 1 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

☐ 2 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

☐ 3 Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL
 ☐ 1 Cheek: 1 = ROUNDED 2 = ANGULAR

☐ 2 Brush: 1 = SHORT 2 = MEDIUM 3 = LONG
 ☐ 1 Brush: 1 = NOT COLLARED 2 = COLLARED

☐ 3 Phenol reaction: 1 = IVORY 2 = FAWN 3 = LT. BROWN
 (See instructions): 4 = BROWN 5 = BLACK

☐ 3 Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER (Specify)

☐ 0 ☐ 6 MM. LENGTH
 ☐ 0 ☐ 3 MM. WIDTH
 ☐ 2 ☐ 8 GM. PER 1000 SEEDS

17. SEED CREASE:

☐ 1 Width: 1 = 60% OR LESS OF KERNEL 'WINOKA'
 2 = 80% OR LESS OF KERNEL 'CHRIS'
 3 = NEARLY AS WIDE AS KERNEL 'LEMHI'
 ☐ 1 Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT'
 2 = 35% OR LESS OF KERNEL 'CHRIS'
 3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

☐ 0 STEM RUST (Races)
 ☐ 0 LEAF RUST (Races)
 ☐ 0 STRIPE RUST (Races)
 ☐ 0 LOOSE SMUT

☐ 1 POWDERY MILDEW
 ☐ 0 BUNT
 ☐ OTHER (Specify)

19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

☐ 0 SAWFLY
 ☐ 1 APHID (Bydv.)
 ☐ 0 GREEN BUG
 ☐ 0 CEREAL LEAF BEETLE

☐ 0 OTHER (Specify)
 HESSIAN FLY
 ☐ 2 GP
 ☐ 2 A
 ☐ 2 B
 ☐ 2 C

RACES:
 ☐ 0 D
 ☐ 0 E
 ☐ 0 F
 ☐ 0 G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	Sturdy	Seed size	Vona
Leaf size	Sturdy	Seed shape	Sturdy
Leaf color	Tam W-101	Coleoptile elongation	Eagle
Leaf carriage	Tam 105	Seedling pigmentation	PL145

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

- (a) L.W. Briggles and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.
- (b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts. (See attachment.)

LEAF COLOR: Nickerson's or any recognized color fan should be used to determine the leaf color of the described variety.

14D. Exhibit D, Additional Description of the Variety

2157 is a common hard red winter wheat, *Triticum aestivum* L.

Flowering date of 2157 is 5 days earlier than the variety Scout and 3 to 4 days earlier than Newton. At Hutchinson, Kansas, when seeded about September 30, average first flowering is about 230 days after emergence. Last flowering averages about 7 days later. It is recognized that environmental factors influence flowering of varieties differently.

2157 has averaged 99 cm in height, about 8 cm shorter than Newton and 21 cm shorter than Scout.

The plant color of 2157 at booting stage is blue green.

Anther color of 2157 is yellow, similar to Scout and Newton.

Anthocyanin has been absent in the stem of 2157. There is a waxy bloom on the stem. Internodes of 2157 are hollow. At maturity, stems are yellow and very strong. Normally 4 stem nodes are present above ground. Internode length between flag leaf and leaf below is about 27 cm.

Auricles of 2157 are glabrous and lacking in anthocyanin.

Flag leaves are generally erect at booting and tend not to be twisted. Hairs have not been observed on the first leaf sheath. A moderate amount of waxy bloom occurs on the last leaf sheath. The first leaf below the flag leaf averages about 9 mm wide and 22 cm long when measured at Hutchinson, Kansas, in 1983.

Spikes are generally mid-dense to lax, fusiform, awned, and white at maturity. Awns are rough and about 5 to 7 cm in length. Spike width and length averages about 9 mm and 9 cm, respectively. However, spike width and length are variable with plant population and level of production.

The glumes of 2157 are short and narrow with generally square shoulders, and glabrous. Beaks are acuminate and range from 2 to 4 mm long.

When evaluated at Hutchinson, Kansas, coleoptile color is white and seedling anthocyanin is absent.

Kernels are red in color, elliptical to ovate in shape, with rounded cheeks and a shallow crease. The brush is not collared and medium in size. The embryo is medium in size. Kernels average 6 mm long and 3 mm wide and about 28 g per 1000. Phenol reaction is light brown.

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14D. Exhibit D. (cont.)

2157 is moderately resistant to soil borne mosaic virus. It is moderately resistant to leaf rust (*Puccinia recondita* Rob. ex Desm. f. sp. *tritici*) and moderately susceptible to stem rust (*P. graminis* Pers. f. sp. *tritici* Eriks) races currently common in Kansas. 2157 has not been tested for specific races of leaf rust. 2157 is resistant to GP, A, B, and C of Hessian fly (*Mayetiola destructor* Say). It is susceptible to powdery mildew (*Erysiphe graminis* f. sp. *tritici* E. Marchal). 2157 has not been tested for bunt (*Tilletia caries* (DC.) Tul.) resistance.

2157 has a good yield record when compared with currently grown hard red winter wheats (Table 1). In the presence of *Septoria* spp., 2157 has a pronounced yield advantage over susceptible varieties. Short plant height and superior straw strength give 2157 excellent resistance to lodging.

2157 has good quality characteristics when compared to the average of current standard varieties in the HRW area. It has been tested by the Pioneer Wheat Quality Laboratory for several years. Table 2 gives 1981-83 values for 2157, Newton, Centurk 78, Vona, and all checks grown in plots tested in the Great Plains. Each value is an average of eight tests. The figures show that 2157 is superior to the checks for flour yield and protein while it is slightly poorer for mixing time and tolerance as evaluated with the mixograph. Loaf volume is comparable to Centurk 78 and Vona, but lower than the average of all checks.

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Table 1. Yield comparisons of 2157 with standard varieties tested in 1981-82 and 1982-83. Data represents average of 104 replications.

<u>Variety</u>	<u>Yield (bu/acre)</u>
2157	56
Centurk 78	50
Newton	52
Tam 105	54
Triumph 64	47
Vona	53

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Table 2. Milling and baking evaluation of 2157.

<u>Variety</u>	<u>% Flour Yield</u>	<u>% Flour Protein</u>	<u>Mixograph</u>		<u>Microbake (10 g) Loaf Volume (cc)</u>
			<u>Mx Time</u>	<u>Tolerance¹</u>	
2157	69.3	11.4	3.4	2.9	57.5
Centurk 78	67.7	10.5	3.8	6.4	57.0
Newton	66.4	10.7	3.2	3.9	62.5
Vona	67.3	10.1	3.6	5.4	58.5
All checks	67.9	10.8	3.4	4.6	60.0

¹Mixograph mixing tolerance--evaluated on a 9-point scale on which 9 = very good, 5 = fair, 1 = very poor

14E. Exhibit E, Statement of the Basis of Applicant's Ownership

Pioneer Hi-Bred International, Inc., Plant Breeding Division, believes it is the sole, original and first breeder of the 2157 variety of hard red winter wheat for which it solicits a certification of protection.